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# Digital Regulation of Intellectual Capital for Open Innovation: Industries' Expert Assessments of Tacit Knowledge for Controlling and Networking Outcome

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**Abstract:** Digital regulation implies the quantified measuring and the network infrastructure allowing managers to control the processes of value creation. Digital regulation needs to take into account tacit elements of the value creation process, including unconscious competency, creativity, and intuitive anticipation, to assure the resulting network's innovation growth. Digital society in developing countries is built on the ground of fact change of the economy and social relations, of transition towards an emerging market within the global offline network of interactions and online activities through Internet; the innovative growth imposes the evolution of managerial behavior and attitudes. The main objective of the paper is to obtain indications on the perception of intellectual capital by corporate managers. The exploratory study was carried out in Russian companies operating in different sectors, with the use of the open-ended approach, including focused interviews and group discussion among experts, middle and senior managers from marketing or corporate governance background. The data were complemented by documentary analysis of descriptions of internal processes of the implementation of digital tools of accounting, which includes the human resources control applied for the remote work during the pandemic. Networking helps to coordinate functions between team members at remote work and between teams and administrators. The interviews demonstrated the administrative tendency to under-estimate the non-formalized factors of innovation activity, such as awareness of corporate strategy, creativity, motivation, and affective and behavioral components of communication of the persons involved in the enrichment of intellectual capital. The results show fuzzy boundaries between the intellectual capital components that are difficult to control. This difficulty provokes the preference for the use of "traditional" quantitative indicators that had been implemented at the stage of the financial digitalization, instead of developing new parameters or measuring approaches. The networking emerges synergetic effect if the administrators refuse their monopoly on the uncertainty zones and are oriented to construct the trustful atmosphere of personal responsibility within the network.

**Keywords:** digital regulation; intellectual capital; value creation; cyber-physical systems; IoT integration; multimedia communication; quality of experience; smart space; tacit knowledge

## 1. Introduction

Open innovative business-models are based on the transfer of knowledge. The analysis of knowledge creation and exchange provoked the interest of researchers and practical managers towards the components of knowledge (tacit and explicit) [1,2] that reflect the unconscious and conscious competencies [3] and towards the real process of organizational multi-learning [4,5]. The post-Soviet society in Russia has inherited a specific socio-cultural perception of open knowledge and close informal networks. This historic and cultural feature gives rise to an immature attitude towards intellectual capital; the digital transformation of business and construction of digital societal system require a better understanding of networking with an open knowledge approach.

The concept of intellectual capital was proposed for the purpose of financial analysis of the impact of intangible assets on the market value of a company [6]. This conceptual approach relates to the financial assessment of all non-material assets and performances of a company [7], but the initial attempts were concentrated on the quantitative evaluation of explicit knowledge (intellectual property rights) for the purposes of a better accounting and governance [8]. Studies of the structure of intellectual capital are located in the space of three dimensions—distinction of quantitative and qualitative approaches (1), explicit and tacit knowledge (2), and the dichotomy between processes and results as the core subject of investigation (3). The first kind of study is concentrated on assessing the formally registered intellectual activity results (a quantitative measure of explicit knowledge), the other edge of the studies is built around evaluating and governance of the human capital involved in the process of value creation (qualitative research of tacit knowledge transfer, of organizational learning [9]). The wide bulk of studies [10–13] reflects the deep interest of scholars and professionals to the intellectual capital creation, measuring, and implementation.

The increasing consumers' preference for renewing and improving life, as a post-modernist societal change and a marketing factor, provoked the business re-orientation to constant innovation and to the expansion of open business-models. The growth and industrial competitiveness are based on the advanced technologies [14], speed of innovation, on the capacity to follow a leading strategy which is elaborated and carried out by human resources of the business, by the competence of people involved, their creativity, the originality of their thinking and acting, the intuitive capacity to guess the customers' preferences and choice, and the motivation and readiness to iterate multiple attempts. This approach of transfer "from being to becoming" [15] evolves within the business through the intellectual capital structuring and embodiment of regulative mechanisms implemented to the non-accountable phenomena, that were presented in the analysis of Johnson and Kaplan in 1987 [16].

The broad "margins" on the borders of contact between elements form the crucial space for innovation activity—these margins represent the fields of communication between the internal universe of business processes and the external environment of the company, between administrators and practical experts, between team members [17]. The analysis of the core explicit elements of intellectual capital is insufficient: the intellectual outcome appears in the form of the number of inventions and patents per capita, metrics of published research results. In fact, the efficient corporate governance and authorities' policy-making is based on the understanding of the sophisticated inter-connections of values scales, behavioral norms, and short- and long-term interests of stakeholders. On the basis of the analysis of knowledge production, K. Sveiby proposed to treat networks of value creation instead of chains [18].

Since the 1990s, this problem has been discussed in the post-Soviet and Russian economic and accounting community due to the introduction of digital tools. The information technology (IT) infrastructure has been implemented by the tax authorities in Russia since the early 2000s in biggest cities and by the 2010s it covered the whole territory of the country [19]. The translation of the value creation chain into a digital accounting model was the subject of practical analysis and academic research, including Master and Doctorate studies [20–22]. The implementation of the actor-network theory [23–26] helps to

introduce the networking conceptual approach to the digitizing processes. Internet of things (IoT) required the new investigation of the core elements of intellectual capital as the fundamental resource for value creation.

This paper represents an exploratory investigation aimed at understanding the perception of the relevance of intellectual capital analysis in Russian companies' governance for open innovation and networking policies. Because of the chosen research approach, the research results may lack generalizability. The inherent problem of transfer from qualitative values toward quantitative objectives is presented in the description of the shaped behavioral model. The digital regulation based on the analytical tools of neuron network technologies could help to find the deeper components of human capital examination and assessment that would be used as part of the intellectual capital development.

This paper treats the contradiction between the qualitative goals and quantitative indicators as one of the practical implications of the theoretical problem of connection between formalized results of intellectual activity and divergent conscience as a basis for creating new knowledge. This issue is examined in this paper from the point of view of the search for the better system of measures that could have positive impact on the innovative growth of Russian economy through the intellectual capital development by the public and private organizations' networking. The essential hypothesis of the research is the underestimation of the tacit knowledge by managers, including the priority given to the measured quantitative outcome related to the responsibilities and duties of managers according to their hierarchical positions. This bias can lead to incorrect digitalized governing systems. To avoid the erroneous solutions for digital regulation, specific research is needed in the organizations and industries.

This study was carried out with the interviews of the experts—practitioners of industries such as IT sector, automobile construction, and machinery that are typical for the real economy structure of Saint-Petersburg area. The interviews, group discussions, and analysis of documents allowed the authors to conclude on the structure of intellectual capital as an efficient explanatory scheme to build the connections between the digital regulation indicators to determine the strategy of innovation growth and the expansion of business.

## 2. Background

Intellectual capital has been examined as a factor of value creation since the middle of the 20th century. The analysis of W.W. Leontief (1953) [27] launched a wave of studies of high qualified labor as a specific factor of gross domestic product (GDP) growth. The learning organizations and double loop of learning represented the use of knowledge within companies (Argyris, 1974) [28]. J.K. Galbraith (1973) [29] used the term “intellectual capital” to emphasize the public interests of the economic development of a society.

Intellectual capital as a term was introduced in 1958 [6] (p. 6); further research of this notion in the field of financial analysis appeared only in the 1990s, but the broad bulk of studies in the economy of knowledge, management of intellectual property, society of information, and learning and cognition processes in education were carried out in the second half of the 20th century. In the 2000s, digital economy studies added the understanding and the practical tools for the externalization and formalization of knowledge as a part of intellectual capital on the levels of companies and of regions, national states, and supranational integrations (such as European Union).

### 2.1. Intellectual Capital for Accounting Purposes

The first accounting evidence of the importance of intellectual capital was related to the discovered “difference between the company's market value and the book value of the company's assets or from its financial capital” [30]. This approach allows accountants to assess the aggregated value of the intellectual capital of a company, e.g., for mergers and acquisitions (M&A), or for advertising and public relations (PR) (APR) purposes.

The three points of view, thus, can be revealed:

- to govern the system of a business—this is the main aspect examined in this paper, it is oriented to improve the construction of the value creation chain of a company and to increase the innovation leadership’ potential of a region;
- to achieve the goals of stockholders and increase the value of an enterprise—this position is understood in this research as the goal-setting element that is insufficient to efficiently run a business and drive the innovation growth of a region or an industry;
- to assess the specific value of the intellectual assets—this point of view is mentioned in this research as the tool to achieve a punctual goal, e.g., for M&A situations and making a decision, or for APR objectives, to improve the image; but this paper does not treat this position in depth.

The first and second approaches we can identify as a process-oriented perception of the work with the intellectual capital as a phenomenon, to improve the decision making and governance of the intellectual capital and its components. The third point of view interprets the intellectual capital as outcomes in their resulting form and helps to get the calculated data for analytical reasons.

To better calculate and predict the market value, and to anticipate the performance of a company and the stockholders’ interest, the analysis of the formation of this value has been undertaken since the 1980s, to better understand the composition and the processes to influence the intellectual capital of a firm.

## 2.2. Intellectual Capital for Governing Purposes—Revealing the Components to Impact

The wide range of studies witnesses the great attention that is paid by state governance and corporate management to the processes of intellectual capital generating and development. This interest is related to the saturation of markets that lead to tough competition in the markets. The increasing consumer’ preferences for renewing and improvement of life produce the companies’ orientations to constant innovating and to the expansion of open business-models. On the level of the public administration, the competition between territories makes local and national authorities take part in place branding activities and to adopt protective strategies for the localized business. The protection and competitive policies of the states and integrations are intended to stimulate the leadership of companies in the innovations. If the achievement of the fixed objectives does not produce the growth of market share in the concrete sector, the authorities’ governors or corporate managers are re-thinking the indicators [31].

Innovation growth is today an economic environment, where companies and regions look for ways to assure the best place in the global socio-economic system. If half a century ago the innovations (product, technology, or market novelties) were perceived as a list of separate targeted points of economic agents, the 21st century transformed the constant process of renewal and novelty introduction for punctual activities to a fundamental ground for successful functioning. Stimulating knowledge creation and transfer is considered a part of the innovation support by the local, national, and supranational authorities.

The transfer of knowledge between macro- and micro- levels of governance for supporting the innovative growth is based on the conjunction of the measurable character of goals to obtain and the intangible character of assets as resources to be used for achieving the goals. The organizational dysfunction, as a divergence of values to embody and shape behavioral models, represents the micro-level of the same problem. The transfer from macro-policy aims towards the micro-level of stimulating agents’ behavioral models aggravates this dysfunction, which can be demonstrated in the example of Russian innovation policy and the real weak results in the statistical data on the patents registered and R&D carried out by companies. The dependency of Russian industrial companies on imported technologies and materials illustrates the insufficient link between goal-setting and results achievement.

The concept of intellectual capital includes two aspects—“intellectual” and “capital”: the results of intellectual activity are taken into account as an asset that produces a specific additional value. T. Sakaiya demonstrated the role of knowledge as the core factor for

creating new value since 1970s [32]. T. Stewart defines the term of intellectual capital as “a capital asset consisting of intellectual material. To be considered intellectual capital, knowledge must be an asset able to be used to create wealth. Thus, intellectual capital includes the talents and skills of individuals and groups; technological and social networks and the software and culture that connect them; and intellectual property such as patents, copyrights, methods, procedures, archives, etc. It excludes knowledge or information not involved in production or wealth creation” [33] (p. 5).

This definition consists of two points: the description of the structure of intellectual capital and of its function to produce wealth, to add value.

The threesome structure is presented in a wide range of studies, the essential groups of structural elements are:

- human capital (talents, skills, competences, qualification, motivation, capacities, and correct involvement of people, etc.);
- relational, or cultural, institutional capital, pertaining to the relationship that is built by the company with the internal and external stakeholders, including reputation; the relational capital refers to the regular interactions and is based on the confidence in the company from the stakeholders, “is centered on humans and the infrastructure that allows companies to function” [30]. The organizational capital can be subdivided into the interactions that are built inside and outside of the business, to be coherent to the interests of all stakeholders;
- internal structure, construction of the value creation chains and networks, including the process capital, presented in procedures and methods of work, oriented to conjugated traditions and innovations, e.g., to extend the traditional image on new networks, such as digital and social media space, and to translate the existing competitive advantage to the new context.

These three groups of structural elements of the assessment of intellectual capital are presented in several studies, including the sub-structures, such as clients (reputation) and organization (management) related sub-groups; innovation and procedural capital; networking as construction of the incoming and out-going flows of resources (systems of relationship with partners, suppliers (IFAC, 1998) [34], authorities, dealers), that are briefly presented in the Table 1.

**Table 1.** Essential approaches to structure the intellectual capital of a company.

Authors and Publications	Human Capital	Relational (Clients and Partners, Reputation)	Structure, Organizational Capital	
Stewart, 1997 [33]	+	+	+	
Sveiby, 1997, 2018 [18,35]	+		external structure	internal structure
Edvinsson, Malone, 1997 [36]	+		+	
Bontis, 1998 [37]; Mention, Bontis, 2013 [38]	+	+	+	
Saint-Onge, 1996 [13]	+	+	+	
Roos G., Roos. J, 1997 [39]	+	+	+	
O'Donnell, O'Regan, 2000 [40]	+		external structure	internal structure
Van Buren, 1999 [41]	+	+	innovation	Process
Pulic, 2004 [42]	+		+	
Inkinen, 2015 [43]			+ impact on innovating	

Source: compiled by authors from [44,45].



The approaches presented in the Table 1 are based on the management point of view—they describe the aspects to be ruled and to be improved by the governors of a business.

### 2.3. Intellectual Capital for the Management Point of View—Revealing the Goals to Achieve

The management position is oriented to the narrower task to satisfy the economic and social interests of stockholders, owners, and investors—to increase the revenues and to strengthen the position in the community and society.

This point of view determines the attention paid to the confidence, reputation, and external relationship of the business. From the macro-policy level, the goal setting itself is under question—should the government adopt a policy directed to:

- the efficiency of business or social protection of citizens (dilemma efficiency—protection, presented by right and left politicians)?
- Community prosperity or individual flourishing (preference for group, social interests, or personality self-actualization, “private—public” choice)?
- Growth or security, including the innovation and structural reforms of economy or the preference for the traditions and conservation of the nature, culture, and humanity (including environmental issues and social responsibility)?
- Short-term or long-term aims of development, that orients, e.g., the corporate management, to improve the momentary financial results (short-term logic) of a company, to increase the market share (middle-term reasoning), or to develop the potential (long-term vision), to invest in infrastructure, human development, etc.?

This point of view is examined in the vast array of studies of the impact of intellectual capital and its components on the business performance, e.g., with the methodology VAIC (value added intellectual coefficient) including the capital employed efficiency (CEE), human capital efficiency (HCE), and structural capital efficiency (SCE) proposed by Bontis in 1998 [37] and Pulic in 2000 [46]. Tobin’s Q is used to assess the intellectual assets’ replacement cost. The studies have been undertaken on the basis of statistical data and on empirical research in developed countries: for Scandinavian countries, e.g., Sweden, K.-E. Sveiby made several publications since 1980s [7,18,35], diverse territories are studied by N. Bontis [37,47]. National cases are largely examined by researchers: Portugal [48,49]; Spain [50]; Greece [51,52]; Belgium and Luxembourg [38]; Finland [53]; USA [54]; Austria and Croatia [46]; Australia [55], Japan [56]. Similar studies in developing countries show the ambiguous results about the degree of strength of impact of intellectual capital on the performances of a business, e.g., in India [57], Malaysia [58–60], Saudi Arabia [61], Iran [62], Pakistan [63,64], Kuwait [65], Turkey [66], in Islamic banking sector [67]; several studies demonstrated even the negative impact of the intellectual capital through the method VAIC on the ROA (return on investment) for the Islamic financial institutions in 21 countries, or absence of impact of the VAIC on ROA in Turkey in banking sector [68] and of significant impact in Indian banks [69].

These results demonstrate the difference of impact of the intellectual capital on the financial performance of businesses in developed and developing countries, that witnesses that the monetary measuring method needs some deep elements that exist in developed countries, and is not suitable for specific situations of developing countries. This lack of coherence of the monetary assessment implementation can be related to specific goals of the business in developing countries, or to specific culture [70], policies and economy state, that together determine the specific approach to the goal setting and the governance of the business as a whole and of the intellectual capital in particular.

The different nature of goals of the intellectual capital management orients toward the market. L. Edvinsson [71] (p. 368) defines the intellectual capital of a company as “the possession of knowledge, applied experience, organizational technology, customer relationships and professional skills that provide . . . a competitive edge in the market”. This orientation helps to broaden the analysis from the financial measurements to the governance of a positioning strategy of a business in the sector and market segments.

Another issue relates to the problem provoked by the over-financing and investing in human resources or relational capital (reputation, public relation, partners' and stakeholders' confidence) if these investments do not produce the added value due to the innovations and/or increase of productivity [72]. This situation can be treated as a misuse of human or relational capital.

The role of human capital can be accounted for, in fact, twice. Firstly, the assessment takes into account the competences of the staff. Secondly, the skills and commitment of human resources act as a specific factor for the improvement of other components of the intellectual capital structure. Qualified and motivated staff tend to establish more efficient systemic interactions with partners and improve the efficiency of business processes—this positively influences both external and internal relationships [48,73].

D. Yurianda and E. Masdupi [30] demonstrated in their study that intellectual capital has a positive and significant effect on company performance and a weak effect on a firm value. This can be explained by the influence of intellectual capital as a sequence of impacts, from human capital on quality of management and from improved administrative and governance system toward the company value, the latter correlation mediated by the managerial system of an enterprise.

Nevertheless, as K.-E. Sveiby [7] (p. 346) writes: “even if the most valuable individuals leave a company . . . , at least parts of both the internal and the external structures will probably remain intact and can serve as a platform for a new start”. That means that in several kinds of situations, the most considerable impact is produced by the relations built by the organization. The institutional reliability and confidence of clients and partners are, in several cases, the most important factors that influence on competitiveness [74,75].

These specific cases represent the industrial particular conditions, or potentially, the artificially implemented separation between the human elements of confidence as trustful relation to a person or to a community as a system of values and behavioral norms. For example, the selection of employees and the promotion of managers inside a company embody the value scale of the organization, but this value scale exists in the cognitive maps of people. C. Argyris and D. Schön stated that “they contain assumptions about self, others and the environment—these assumptions constitute a microcosm of science in everyday life” [14] (p. 30). These cognitive models exist in the form of behavior implemented by managers and employees, by humans presented in the organization: “organisational (structural) capital is referred to the management's ability to efficiently apply . . . corporate culture, philosophy and mission, management structure, and efficient business processes, including those related to the accumulation and transfer of knowledge” [45].

We can also consider the structure of this concept through comparison with the threefold attitude, disposing people to activity. Intellectual capital represents a cognitive instrument to structure the capacities of a business to create and commercialize knowledge—rational (technologies, new needs or new ways to satisfy the existing needs), emotional (symbolic capital, reputation, clients' relationship), and behavioral (consumption models) elements. These three components correspond to the cognitive, affective, and conative components of attitudes [76–78].

#### 2.4. Problems of Quantifying Qualitative Phenomena

The translation of the value creation process into quantitative indicators produces a lack of tacit knowledge that emphasized intellectual capital governance.

In the definition proposed by T. Stewart [33], there are elements of formalized knowledge (patents, copyrights, archives), such as intellectual property rights and databases. This component of the intellectual capital's structure differs from the previous ones because of its book nature—the patents, copyrights, etc. are already the results of economic evaluation, their value is presented as an accounting assessment.

This component represents the quantified value, but, to stimulate such results, the quantitative measures are not efficient: the engineer who intends to register a number of inventions and to create a number of patent files, is not oriented to the essence of her/his

invention, but to the prime or bonus to be obtained (the external motivation replaces the internal one, the interest and the passion for work). However, intellectual activity is carried out during 24 h, e.g., a dreaming brain continues to work with the subjects. The registration of the patents by the Patent Bureau can last several years or even a decade, the company would wait too long to pay bonuses only for registered patents, the talented people would leave the company if they are not paid. The trap of metrics applied to the field of innovation puts the quality of innovation under question. This micro-level example illustrates the transmission from the goals' system toward the behavioral models' choice [79]. The quantitative external motivation orients the agents to achieve the targeted goals instead of deepening their activity and seeking efficiency.

This externalization of motivation and management allows the staff to avoid personal responsibility and commitment, on the personal level; the external goal setting permits the person's brain to avoid difficult work and to prefer simplified tasks. On the macro-level, this externalization of making decisions and choices, of responsibility for a result, produces the policies oriented to the expenses and not to producing value.

The governance purposes have social nature, K. Sveiby recognizes that "it is not possible to measure social phenomena with anything close to scientific accuracy. All measurement systems, including traditional accounting, have to rely on proxies, such as dollars, euros, and indicators that are far removed from the actual event or action that caused the phenomenon" [80]. The barriers of the intellectual capital introduction into the governance logic have been partly examined [81].

However, several questions remain to be clarified:

- the perception of managers of the intellectual capital as a factor for the competitiveness of a company;
- the weight of the components of the intellectual capital according to the experts;
- the role of informal knowledge for corporate policy-making;
- the informal knowledge as a limited or unlimited factor of value creation;
- the possibilities of regulation of the risky and unpredictable universe of informal knowledge.

These questions help to formulate the hypotheses of the research.

### 3. Hypotheses of the Research

The object of this study is the perception of knowledge as the component of the intellectual capital for the regulation and governance within the construction of the digital regulation of innovation growth in the Russian context. The innovative activities inside companies and industries largely rely on the introduced digital tools and are implemented in the real economic space through the networking of business units in sectors, which has been demonstrated during the pandemic and social isolation period that evoked a transfer to remote work.

The contradiction between the qualitative goals and quantitative indicators is one of the practical implications of the theoretical problem of connection between formalized results of intellectual activity and divergent conscience as a basis for creating new knowledge. This issue is examined in this paper from the point of view of industrial experts. The study was carried out with interviews of the experts—practitioners of industries such as IT-sector, automobile construction, and machinery that are typical sectors for the real economy of Saint-Petersburg area.

The following hypotheses are to be checked:

- H1: is the intellectual capital perceived by managers as an important factor for the long-term performance of a company, leadership, and success of a business in a market? If yes, the human capital of a company is to be fostered, the management motivates talented employees and gives responsibilities and recognition, digital tools are implemented to help people to work efficiently, the networks are built by professionals. Or, does the inherited post-Soviet administrative approach treat the humans as labor-force for managerial controlling aims? In this case, the digital regulation



takes the form of calculation (measuring of hours spent, of volume and number of operations fulfilled), but does not privilege the analysis of the outcome.

- H2: what are the key components of the intellectual capital that have the most substantial impact on business performance? Broad studies demonstrate the leading role of human capital, but there are several reports that present the negative or weak impact of human capital on the company results. H2 consists of checking if the human capital determines the performance, according to the Russian experts surveyed.
- H3: informal knowledge has a more specific impact than the formalized one on business performance due to its unlimited capacity to produce value in N-dimension symbolic space, diversity plays the core role for value creation. The study aims to check if the questioned managers are aware of this impact and recognize it.
- H4: at the same time, the informal nature of personal knowledge leads to a high degree of unpredictability and produces risks in the regulation of intellectual capital. This assumption provokes the unwillingness of managers to treat informal knowledge as the key component of intellectual capital and the core factor of innovation growth. H4 represents the question if the managers who are aware of the human capital's tacit knowledge impact, are at the same time ready to manage the informal knowledge for the monitoring and controlling tools.
- H5: the network relations are generated within the industries and help to build the distributed systems of dealing with the tacit elements of intellectual capital.

These hypotheses are checked through 45 focused interviews (based on a questionnaire) and group discussions, supported by the study of documentation.

#### 4. Materials and Methods

Two essential methodological approaches were implemented to verify the hypotheses of the components of knowledge impact on the innovation growth regulation—the expert survey in the form of informal interviewing of managers and discussion within groups by industries and among industries.

The hypotheses were distributed by the methods as presented in the Table 2.

**Table 2.** Methods used for checking the research hypotheses.

	Hypotheses of the Research	Methodology
H1	Experts recognize intellectual capital as a factor for the long-term performance of a company.	Interviewing
H2	Experts figure out the weight of the components of intellectual capital (human, relational, structural capital, intangible assets) and their functional impact on the business performance.	Interviewing and discussion <sup>1</sup>
H3	Experts recognize the tacit knowledge importance.	Discussion
H4	The informal knowledge has the deeper and more sophisticated impact than the formalized one on the business performance (h4.1) due to its unlimited capacity to produce added value for several dimensions of value creation chain or network (h4.2).	Interviewing and discussion
H5	The specific features of policy-making and management as activities provoke the refusal to check and control the informal nature of the personal knowledge due to high degree of unpredictability and risk, which leads to the underestimation of informal knowledge and human capital.	Interviewing and discussion

<sup>1</sup> Combination of methods permitted to clarify the reasons and meanings of answers given by respondents.

The hypotheses represent the complex perception of intellectual capital for the creation of added value. The null hypothesis for the whole research is the equal attention paid by managers to different factors of the performance of a company in long-term perspective and equal importance of elements within the structure of intellectual capital. The alternative hypothesis represents the privileged care about tacit knowledge and about process of creation of intellectual capital, the specific concern of managers about capability of their

company to retain the core persons and the awareness of the contradiction between the risk of innovative behavior of the most high-skilled people and the controlling capacities of the top and middle managers.

The interviewing and discussing permitted to better understand the reasons for the resistance of the management (similar to the resistance to innovation) to operate with informal knowledge and to fix strategies in the field of governance of the human capital, within the specific conditions of Saint-Petersburg (as the city called “intellectual, cultural and educational capital city” of Russia) and within the actual Russian context.

The perceptions obtained due to the research allowed the authors to conclude on the evolution of the regulation approaches efficient for the growth based on the intellectual capital within the context of the digital economy and automation tools implemented for the intellectual analysis and governance. The research aims to reveal the level of consciousness of organizational management of the essential components and factors of the positive (or negative) influence of intellectual capital development on the whole business success.

The tools used for the survey reflected the aim and hypotheses mentioned above. These considerations are presented in the questions that are formed as open topics for discussions and as a questionnaire for interviews. A list of issues has been consequently presented during the meetings for discussion. The questionnaire was used for a personal conversation with each interlocutor.

#### 4.1. The Sample and Procedure Description

The top and middle managers of Saint-Petersburg companies and organizations were involved as experts, from small (under 20 people) to medium size (24–200 employees for IT sector, chemistry, and handicraft) and large organizations (staff from 700 to about 20,000 people, in banking and education sectors) in November 2019–November 2020.

The meetings were organized inside companies of the IT sector and chemistry (two discussions offline), and the representatives of different companies took part in the “mixed” meetings between banking and IT, education, and handicraft (one discussion offline and one discussion online through the portal discord.com, the choice was made by experts invited).

The 45 experts were interviewed (see Table 3) through the questionnaire (see Appendix A, Table A1).

**Table 3.** Distribution of experts by sectors, according to the companies’ size (number of employees) and ownership (control), persons.

Sector	Size			Control <sup>1</sup>		Total
	Small	Medium	Large	Private	State	
IT	2	7		9		9
Chemistry		6		6		6
Handicraft, souvenirs	7	3		10		10
Education		2	12	2	12	14
Banking			6	3	3	6
<b>Total</b>	9	18	18	28	17	45

<sup>1</sup> The control represents the distribution of ownership.

Taking into account the high ratio of the state in the Russian economy, the distribution between the size and the control (ownership and operation governing) represents the normal situation, where the smaller companies are private businesses and the bigger organizations and institutions belong to the federal level of the Russian State that is especially typical for education and finance. The smaller companies are more flexible to market changes. The largest organizations are established to solve the social tasks (i.e., education) or the common economic tasks for the whole country (i.e., banking).

The chemistry and handicraft can be treated as the production sector, the IT, education and banking represent services sector of economy. A considerable part of St. Petersburg consists of the defense production (shipyards, aircraft and space manufacturing,

mechanical engineering, etc.), but these enterprises are closed to contacts and require special permissions from the state authorities, they are not included in the research, and researchers take into account this limitation of the results obtained.

#### 4.2. Organization of the Data Collection and Treatment

The first discussions were decrypted and analyzed before the interviewing. These discussions allowed the researchers to improve, to correct, and extend the questionnaire. The mixed discussions were organized to deepen the understanding of the answers given and to enrich the perception of the differences between industries from the point of view of the knowledge used.

The collected answers to the survey were analyzed with MS Excel statistical functions (this software is free of charge and contains the essential functionality for statistical analysis).

### 5. Results

The results include the answers obtained during interviews and the opinions and judgements which were expressed during discussions. The results are presented according to the order of questions ( $Q_n$ ) in the questionnaire.

#### Q1. Does knowledge play a significant role in the success of your company?

This question is introductory and opens the interview, it outlines the further conversation and, from psychological point of view, helps to create the positive atmosphere. All the experts (100%) recognize the role of knowledge for the successful functioning of the companies surveyed, all of them answered: “yes, the knowledge plays a significant role” to the first question, this positive reaction helps to build the efficient attitude toward the following list of questions to ask.

During the discussion, one of the top-managers of finance and credit institutions stated that he cannot imagine a manager of the banking sector or another industry, who would answer differently, because we live within the context of the information society since the middle of the last century, and banking is based on the analysis of knowledge and making decisions.

Further questions did not provoke the same unanimity and serve as the base for the research.

#### Q2. Has your company created and registered any intellectual property (IP) right—patents, licenses, registered software, etc.?

The experts paid attention to the awareness of intellectual property (IP).

Meanwhile, they have doubts about the numbers, especially in finance, managers presented two polar situations—a huge banking and credit institution representative is certain that the original software is registered in the form of intellectual property right (license), but the other five persons from the banking sector said that the internal software is the intellectual product and, certainly, the intangible asset, but is not fixed under IP protection form (patents, licenses, etc.), exactly because of their internal use and the unwillingness of the institutions to disclose their instruments and outcome, even due to its constant change and improvement (see Table 4).

The chemistry (100%) and IT companies (88.9%) represented a similar mindset—they have several or many IP rights that are fixed according to the rules. In the chemistry industry, 5 of 6 managers chose “many” IP rights, and one person answered “about a dozen”; in the IT sector, the distribution is more balanced between variants (the responses “many” and “about a dozen” were given by 33%, “several” and “no one” was chosen by 22%).

**Table 4.** Distribution of the number of intellectual property (IP) rights (patents, licenses, registered software, etc.).

Answers	IT	Chemistry	Handicraft	Education	Banking	Total <sup>1</sup>
Many	33.3%	83.3%	0.0%	14.3%	16.7%	24.4%
About a dozen	33.3%	16.7%	0.0%	0.0%	0.0%	8.9%
Several	22.2%	0.0%	0.0%	7.1%	0.0%	6.7%
One IP right, patent, license, pilot model, etc.	0.0%	0.0%	0.0%	7.1%	0.0%	2.2%
None	11.1%	0.0%	100.0%	71.4%	83.3%	57.8%

<sup>1</sup> The total is calculated on the basis of answers given by all respondents of the sample (N = 45).

Special attention can be paid to the responses received from educational institutions that have no intellectual property created and registered, according to 83.3% of respondents. The administrative staff representatives had taken part in the accreditation procedures, they are aware of many formal indicators of their universities, but only the person responsible for the expertise of Polytechnic University said that she has clear data of many IP rights registered by the institution (this answer is true). Other reasons explain the response “many” given by the eminent professor and the head of the department at the Electrotechnical University (LETI)—she has herself authorship of several patents, and she concluded about IP rights of other professors and she was absolutely right because the LETI University has thousands of patents since the Soviet period.

Another response from the Electrotechnical University, which also has recently passed the accreditation procedure, tells of “several” registered IP rights and this answer is, in fact, partly correct because during the last period of accreditation, LETI reported four IP rights [82]. The same reason led to the choice of the response “one IP right registered” given by a manager of Herzen University: during the accreditation expertise procedure, the official number is “one” (reported for the five previous years), nevertheless, the natural sciences faculties had produced many patents, since the Soviet period and until today. This means that the response choice was largely influenced by the bureaucratic procedures imposed by the Ministry accreditation, and the managers underestimate the intellectual results of their educational organizations due to the obligation to take responsibilities for each point.

This conclusion supports the hypothesis H5: the bureaucratic organizational type leads to the underestimation of the assets of intellectual capital if it is not presented in the reporting.

### Q3. Is your trademark registered?

We can conclude that the managers do not evaluate trademark registration as an important aspect. However, they pay much attention to the company’s reputation (see answers to the next question, Q4).

Among the top and middle managers, the question about the formalization of the name of the company (“is your trademark registered?”) led to considerable differences: in the banking sector, all six experts said that the trademarks of their institutions are registered. In other sectors, no one gave a clear positive answer: in chemistry, 100% of experts said “no”; almost all the managers of handicraft are sure that their trademarks are not registered (except one person who had doubts about this), the majority of administrative heads of education and IT sectors (85.7% and 56.6%) are not sure whether the trademarks of their organizations are registered or not. (see Table 5).

**Table 5.** Answers given to the question “Is your trademark registered?”.

Sector	IT	Chemistry	Handicraft	Education	Banking	Total
Yes	0.0%	0.0%	0.0%	0.0%	100.0%	13.3%
No	44.4%	100.0%	90.0%	14.3%	0.0%	46.7%
I don't know	55.6%	0.0%	10.0%	85.7%	0.0%	40.0%

The answer “I don't know” is given, in total, by 40.0% of administrative people, which reflects the low importance and attention paid to the protection of the name and trademark of the companies. To verify the hypotheses of the research, it is necessary to compare this distribution to the answers about the importance of reputation and the explanations related.

#### Q4. Which role plays a reputation for the success of the business?

At the end of the survey, the experts were asked about the role that reputation plays in the success of the business. The banking sector demonstrated the same unanimity as for the question on the registered trademark: all six experts said that reputation plays a dramatic role in finance.

Similar results were obtained for chemistry (83.3% of respondents chose “dramatic” and 16.7% significant) and education (57.1% “dramatic” and 42.9% “significant”). (see Table 6).

**Table 6.** Evaluation of the role of reputation for the success of a business.

Answers	IT	Chemistry	Handicraft	Education	Banking	Total
Dramatic	22.2%	83.3%	0.0%	57.1%	100.0%	46.7%
Significant	44.4%	16.7%	30.0%	42.9%	0.0%	31.1%
Not very important	22.2%	0.0%	40.0%	0.0%	0.0%	13.3%
No	11.1%	0.0%	30.0%	0.0%	0.0%	8.9%

The handicraft managers have a different opinion about the role of a reputation for their business: 30% said “no”, 40%—“not very important” and 30%—significant.

The IT sector companies' managers gave diverse answers: two persons chose “dramatic” and almost half of the managers—“significant”, but two respondents said that the reputation is “not very important”, and one person that it is not important at all.

These responses reflect the attitude of small and middle companies in the software service; for them, the factor that affects outcome is not a “name”, but rather, their portfolio and the names of the people involved. The company may be unknown, but the reputation of the developers and key specialists plays a dramatic role due to the previous experience of work, this is the personal reputation based on a “snowball” of the recommendations.

During the discussions, the same situation was identified for handicraft companies. They are well-known by names of the key persons of the companies, these names are followed with a history of successful projects and a number of positive “reviews”. IT sector experts do not consider customer reviews as the reputation of their companies, but they recognize the importance of the previous positive experience expressed in the portfolio of the professionals working in the companies. One of the top-level managers of a middle IT company has explained the complex structure of the reputation as a system that includes:

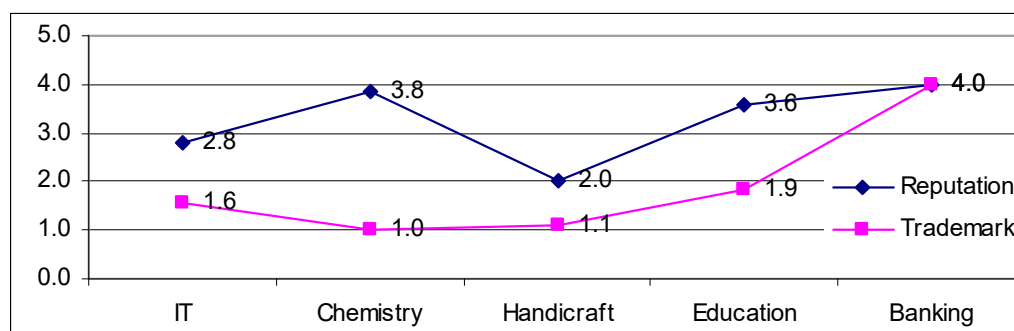
- reputation of professionals employed by the company (a),
- the customers' opinion about the software the company is working with (b),
- the comments and reference marks of their previous projects and customers (c).

According to this respondent, these three components of the company reputation are the most significant for the success, they play a crucial role as the core competitive



advantage, and she said that “the company name does not play any role, but the set of these factors determine the survival of the business”.

If we take the assessment “dramatic” equal to 4 points, and the registered trademark is “important” also at 4 points, the “not important” and “not registered trademark” equal to 1 point, we can present this comparison of two evaluations on the graphics (see Figure 1):



**Figure 1.** The divergence between the importance of reputation and of trademark registration by industries.

The banking institutions’ representatives gave the same answers about the highest level of the impact of both reputation and trademark on the successful development of their organization on the market. Both indicators are quite close to handicraft with a low degree of importance. In the IT sector, the respondents assessed both elements with quite a low level of influence, but this industry has a multi-component structure of reputation.

The education institutions managers gave similar responses about the importance of reputation and the ignorance of the official registration of the trademark.

The diametrical answers were given in chemistry, where the trademark has no impact on the results of the company activity, and the reputation determines the successful functioning.

These results support the hypothesis H4: the formal intangible assets play lower role than the informal knowledge elements (H4.1) and the informal elements can have complex structure and sophisticated determinants by nature and by functions (H4.2). The correlations between the answers about trademark and reputation are highly negative for IT sector (with Pearson’s coefficient of  $-0.705$ ), are negative for education ( $-0.354$ ), and slightly positive but too low for handicraft ( $0.272$ —this level is not statistically significant); for chemistry and for banking the coefficient of correlation could not be calculated, because all answers to the first question were the same and none of variety of answers produced the lack of sense of correlation assessment. At the same time, the calculation of chi-squared demonstrates the high level of difference of assessments for chemistry ( $\chi^2 = 2.833$ , significant with  $p = 0.05$ ).

This result highly depends on industry, e.g., the hypothesis is proven for chemistry and IT, and cannot be checked on these data for the sectors of education (the null hypothesis cannot be clearly rejected on the basis of this data), handicraft or for the banking sector; the correlation between the assessments of banking sector seems to reject H4.1 and cannot be checked for H4.2. The answers to the following questions can help.

The perception of intellectual property as an expense, investment, or source of income is analyzed with the next questions 5 and 6.

#### Q5. Do you use expensive technologies, software, or other external intellectual property?

If this question provoked doubts or perplexity during the interviewing, the text was specified: Have you paid royalties for a specific intellectual property right?

The managers of companies in finance, IT, and chemistry are clearly informed about the expenses of their organizations on intellectual property use. All the respondents from the banking sector said that the organization does pay royalties, and 100% of managers of the chemical industry said that they do not, using open-source office software and their

own specific industrial developments, e.g., distributed by the governmental agencies and authorities according to the accreditation procedures (it is for pay, but it is not perceived as payment for software but as the accreditation fee).

The IT sector administrative staff are strictly aware of the expenses related to the IP, but in smaller companies, they prefer to avoid any payments for IP (33.3%), meanwhile, all the respondents from middle-sized companies choose to pay for the software used in one form or another (66.7%).

In the handicraft industry, people consider the IP payments too high for their business, 90.0% are sure about the absence of such expenses. In education, the majority of respondents do not know if the organization pays any royalties (78.6%) (see Table 7).

**Table 7.** Distribution of awareness of expenses (royalties) paid for the use of technologies or intellectual property.

Answers	IT	Chemistry	Handicraft	Education	Banking	Total
Yes	33.3%	0.0%	0.0%	14.3%	100.0%	24.4%
No	66.7%	100.0%	90.0%	7.1%	0.0%	48.9%
I don't know	0.0%	0.0%	10.0%	78.6%	0.0%	26.7%

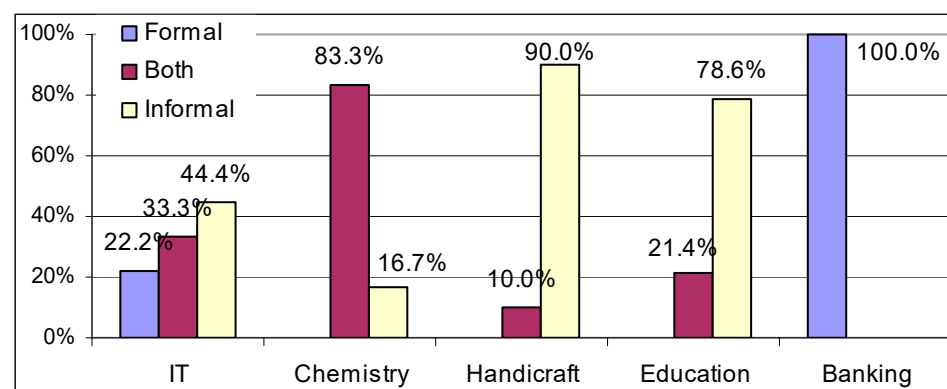
The whole result demonstrates the influence of the size of the company on the expenses on IP: no small business respondent said “yes”, only one education institution representative said “no”. Even if the sample is small, we can look at the Pearson’s correlation between the size of the company (staff for small and medium companies, approximate number of employees for the biggest organizations, i.e., for banking institutions in thousands of people, education institutions in hundreds of people) and the answer on this question (if we take the answers as points, no = 0 pts, yes = 2 pts, I don’t know = 1 pt), the correlation is 0.541, with the coefficient of variation of 1.770.

That means that the factor influencing the most the choice for purchasing intellectual property is the size of the organization.

**Q6.** *Do you think that formalized knowledge creates higher value than informal knowledge?*

The representatives of the finance sector gave visibly different answers than the other industries’ experts to the next question about the preponderance of formalized or informal knowledge in creating value.

All banking sector experts (100%) consider the formal knowledge as the fundamental factor for the creation of value in financial, credit, and investment services, that is explained by the strict regulation and rankings that determine the activity (see Figure 2).



**Figure 2.** Distribution of opinions about the predominance of the formal or informal knowledge for the value creation in the business.

All the chemistry managers said that their competency is based on the balance between the formalized knowledge and informal components: the accuracy of chemical analyses is determined by the ingenuity and experience of the specialists more than by the formal instructions describing the procedures to follow, but there are safety rules and industry regulations that are absolutely compulsory for survival of people and for performance of the business. When they were asked which option to choose, 83.3% chose “both” and 16.7% preferred “informal”.

The general result for all respondents is inclined to the informal knowledge (55.6% of experts chose this option), 29.6% preferred the balanced answer of the considerable impact of both formal and informal knowledge, only 17.8% chose formal elements of knowledge that play the most important role for the creation of value in their businesses (and among them, all the experts from banking sector, and two representatives of IT companies).

The null hypothesis would include the equal distribution between formal and informal elements of intellectual capital (25%) and a half of the sample would choose the option “both” (50%). The statistical importance of these results is verified for all industries, except the IT sector: chemistry ( $\chi^2 = 6.243$ , significant with  $p = 0.01$ ), handicraft ( $\chi^2 = 7.808$ , significant with  $p = 0.001$ ), education ( $\chi^2 = 5.300$ , significant with  $p = 0.01$ ), and banking ( $\chi^2 = 10.833$ , significant with  $p = 0.01$ ), but for the banking sector, the unanimity of this choice can be explained not only by the specific features of the type of activity, but also by the size of organization. However, if we calculate the importance (chi-squared) for the whole sample ( $N = 45$ ), we obtain only 1.269—this result demonstrates that the same conclusion cannot be reached for all industries. In fact, the diagram (Figure 2) shows that the choices are opposite for banking for handicraft and education; this contradictory result smooths the conclusion.

The clear determinant of choice in this question is the size of the organization: the correlation between size and response is statistically significant and quite high, 0.637 (Pearson’s coefficient), which demonstrates a close correlation.

This distribution of answers supports the hypotheses H4 and H5. The content of the responses demonstrates the main role of informal knowledge for the value creation (hypothesis H4.1), the distribution of the uncertainty about the cost and income of the intellectual property (Q5 and Q2) compared with the involvement in evaluation of tacit knowledge and reputation (Q6 and Q4), witnesses the dominance perceived in favor of the informal elements of the intellectual capital (Hypothesis H4.2).

The close correlation revealed between the size of the organization and the role of the formalized knowledge supports the hypothesis H5.

The discussions with the experts allowed the researchers to obtain additional explanations of the distribution of responses. The common decision of all the groups consists in the clear dominance of the knowledge economy that requires specific efforts from the top and middle management of companies to organize the effective use of the knowledge inside the company and to balance the different elements of the intellectual capital for all-sized companies, e.g., the representative of handicraft business (production of high-quality collectible toys) told that “we don’t need any diploma of our free-lancers, but we require a portfolio and testing product”, and an IT company manager confirmed this statement: “the same for us, our company does not need any certificate, just a test, but after employment we send our employees all the time to different trainings and learning programs”. This result for the formal intellectual capital in large corporations and for the informal knowledge in the small and medium enterprises (SME), received with the implemented qualitative methodology, helps to support the hypothesis H1.

The unique features of the personal knowledge and human capital (hypothesis H2), which represent the essential aspects of the tacit knowledge (formulated in hypothesis H3) were studied with the questions about the crucial personalities of the companies.

**Q7–8.** *Do you have personalities in your company who plays an absolutely crucial role for the company stable functioning and growth? (Q7) What are the positions of core persons? (Q8)*

The interviewer checks the choice in the Q7: if the respondent says that there are persons who play crucial decisive role in the company for the successful business functioning and development, the interviewer asks: “Could you give a name of a person or of several persons, who play dramatic role, and if they leave the company, would the business disappear?” Q8 orients to the hierarchy positions of such crucial persons, if they are mentioned, or just the positions of people making the vital decisions and being core persons for companies.

The high degree of formalization of activities in finance is represented with the clear choice for the responses “everyone can be replaced” (66.7%), one top-manager reminded the principle Pareto, according to which 20% of the staff in any organization do 80% of the work, but personally, everyone can be replaced (this answer is taken into account as “20–30%”, even if both options were chosen, in fact, by the respondent in his comment). The other expert said that the institution carried out several reductions of staff and now, at least a half of the actual employees are really necessary for the functioning of the banking office because all ballast is “dropped” (see Table 8).

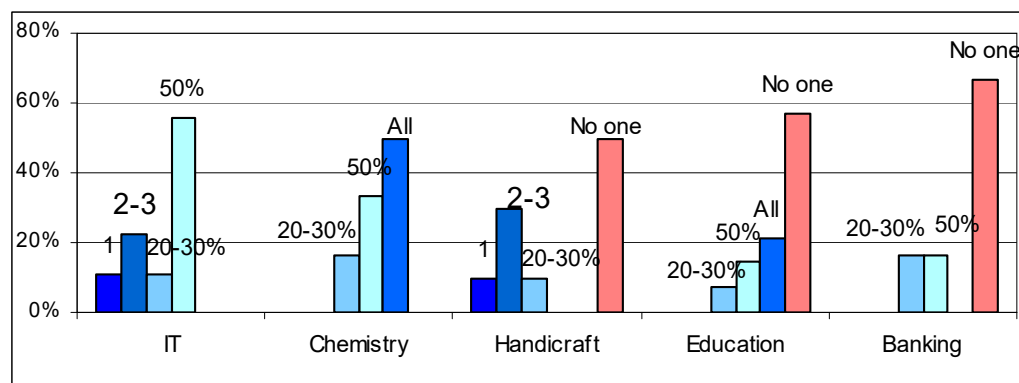
**Table 8.** Distribution of evaluation of unique human resources of organization.

Answers	IT	Chemistry	Handicraft	Education	Banking	Total
A person is indicated as a core “asset”	11.1%	0.0%	10.0%	0.0%	0.0%	4.4%
The 2–3 persons are crucial (names are given by the respondent)	22.2%	0.0%	30.0%	0.0%	0.0%	11.1%
20–30% of human resources are crucial	11.1%	16.7%	10.0%	7.1%	16.7%	11.1%
A half of staff are essential	55.6%	33.3%	0.0%	14.3%	16.7%	22.2%
Everyone is necessary for the company	0.0%	50.0%	0.0%	21.4%	0.0%	13.3%
No core person: everyone can be replaced in the company	0.0%	0.0%	50.0%	57.1%	66.7%	37.8%

Answering this question, banking, education, and handicraft industries gave similar results: 50.0% of handicraft companies’ managers told that they have some persons who make the essential contribution for the everyday survival and the tactic dynamics and strategic development of the company, but in principle, there are no people crucial for business; one person named the owner of the company, and another person mentioned the core production workers who have unique role for the company and, “if they leave, the business will be blocked for a period of time”.

The education experts gave different answers, but no dramatic “human asset” was named in any of the investigated institutions. The famous case of mathematician Y. Perelman (he solved the Poincaré conjecture) is very well known in St-Petersburg; this world genius was fired from the St-Petersburg University because of lack of some internal procedures. This case is an etalon for the educational administrations of little importance that is given to the eminent scientists, whatever the circumstances took place in reality, the symbolic significance of this case reflects the idea of “no one is indispensable”. If we take the answers as points, from “no one” = 0 pts, to “one” = 5 pts, the results were surprising: the lowest level of the dependence of core persons was received for education (0.714 pts), a bit higher evaluation was shown for banking (0.833 pts), and the highest level of assessment of the personalities involved was obtained in IT sector (2.889 pts), the middle levels were obtained for chemistry (1.667 pts) and handicraft (2.0 pts). However, the statistical importance is only sufficient to clearly reject the null hypothesis for the banking sector and to support the conclusion about the preference for the absence of core persons in the organization ( $\chi^2 = 2.750$ , significant with  $p = 0.05$ ). The calculations for other two sectors permit to reject the null hypotheses with  $p = 0.1$ : education ( $\chi^2 = 1.934$ ) and chemistry ( $\chi^2 = 1.861$ ), but for IT sector ( $\chi^2 = 1.812$ ) and for handicraft ( $\chi^2 = 1.630$ ) the alternative hypotheses are not proven with sufficient statistical significance.

To illustrate these data, a diagram was drawn up; the clear distinction is seen in the Figure 3, the answers about the existence of people who represent the crucial asset for the company are visualized in light-dark blue colors, and the answer “no such core person in our company, everyone can easily be replaced” is colored in red (see Figure 3):



**Figure 3.** The experts' opinions on exceptional persons or core staff groups in the business.

The chemistry and IT sector experts demonstrated the understanding of the importance of the “producing” personalities, who effectively manufacture the product and who are located in the center of the value creation chain.

The results of Q6–8 support the hypothesis H3: the experts recognize the importance of the tacit knowledge that is presented in practices (Q6) and in human personal knowledge (Q7).

Apparently, the data would allow us to conclude that the bigger the company, the less attention paid to the personalities and informal knowledge. However, the handicraft companies are small and medium business, according to the permanent staff numbers, and they invite freelancers as external manpower, especially, in the field of decoration and art. Despite the creative nature of work, the answers did not demonstrate the necessity to appreciate the work of people involved, the unique artists are not perceived as authors of masterpieces, chef d'oeuvres. The short or middle term of planning of human development in such companies is related to the use of gig economy and freelance. That explains also why in handicraft firms the core persons are the owners or top managers of the company (see Table 9).

**Table 9.** Distribution of hierarchy positions of core human resources of organization.

Answers	IT	Chemistry	Handicraft	Education	Banking	Total
Owners, stockholders	0.0%	0.0%	50.0%	0.0%	50.0%	17.8%
Directors, managers	0.0%	33.3%	30.0%	71.4%	50.0%	40.0%
Producing staff, workers	88.9%	66.7%	10.0%	21.4%	0.0%	35.6%
Auxiliary staff, accounting	11.1%	0.0%	10.0%	7.1%	0.0%	6.7%

It is worth supposing that the explanations of the great sharing of the judgment “Everyone can be replaced in the company” can depend on the industry and the specific sense of the core value creating activity, i.e., in the crafts, the intellectual capital, both formal and informal, is concentrated in managerial issues (the art and artistic production can bring rent due to the profit-driven management).

Meanwhile, in the banking and education sectors, the size criterion certainly plays an important role, which evidently reinforces the Pareto 80/20 principle explicitly reported by one of the managers interviewed. Between these two sectors there is also a difference; in the education sector the evident contrast between the two judgments “Everyone can be replaced” and “Everyone is necessary” is only apparent, as the two propositions share



the fundamental belief that in the organization there is no concentration of “essential knowledge” in specific people and/or areas, but that it is widespread among all employees (all therefore equally necessary although replaceable). It is especially interesting that the administrative staff is marked as the essential for the educational organizations, not the professors who do the work of teaching and communicating, who execute the knowledge transfer. The explanation was found accidentally, talking about the transfer of culture: the two representatives of the universities managerial hierarchy mentioned, that if a head of department is replaced, the most interesting people will follow the head. In the private university (Saint-Petersburg university of management technologies and economics), the dean even gave the example of a whole department that quit; in Herzen University, the opposite illustration was given, when the head of the institute has considerably improved the teaching staff over two years. Both respondents commented on the transfer of culture with the idea that the personal networks and social capital play the role of the bearers of knowledge and professional behavioral patterns.

In the banking sector, the idea of the algorithms and technologies that determine financial institutions functioning, including credit and investment decision making, is presented in the clear preponderance to the “replaceability” of persons making decision, that explains the development of the “fintech” (financial technological systems that highly resides in automated digital mechanisms and calculations carried out by machines instead of humans).

The combination of results of questions demonstrates that the hypothesis H2 can be considered proven: managers are aware of the importance the intangible assets (Q5), the relational capital (Q3–4), the human element of the intellectual capital (Q7–8), and structural organizational capital (Q2 and Q6). These elements form the intellectual capital that is supposed to play a dramatic role for the company performance and value creation, that is formulated in hypothesis H1, these aspects were discussed according the qualitative methodology, but H1 is not proven according to the statistical analysis. An analysis of the answers of low interest and awareness (“I don’t know”) gives additional understanding of the attention paid by managers to the different aspects of the intellectual capital: the intangible assets (registered trademark and intellectual property rights) obtained the important ratio of these undetermined answers (40.0% about trademark, 26.7% about the implemented intellectual property, and even several wrong answers for the registered patents and licenses). At the same time, no wrong or uncertain answers were provoked by the questions about the tacit knowledge, informal, human, or relational elements of intellectual capital.

The consideration of the core activity and of different distribution of knowledge among the population of the company should be taken into account along with the criteria of size of the organization. The big companies usually have formalized organizational structure that is more easily transferred to the automated mode of management but creates gaps of control for opportunistic behavior and lacks of governance and motivation that do not help to maximize the commitment of employees. The digitalization of communicating modes, remote work, and online activities represent new possibilities to solve these specific problems of large enterprises and to propose new flexible solutions for small and medium companies.

## 6. Discussion

The study represents an attempt to reveal the depth of perception and the typical features of several industries that affect intellectual capital use for improving business. The research was carried out in St-Petersburg, Russia, and reflects the features typical for the city (branded as “intellectual and cultural capital of Russia”) and for the country, taking into account the Russian historic institutional, economic, political, and socio-cultural specific attributes.

Under these clauses, the research results can be interpreted as the analysis of perceptions of the formal knowledge, intellectual assets and quantitative indicators of perfor-

mance by the managers as the most comfortable substance to manage. At the same time, the real business is successful due to the extra competences that exceed formalized knowledge, due to the human capital as bearer of personal knowledge that is too expensive to formalize and to copy. The internal management recognizes the importance of all components in the structure of intellectual capital, including the individual knowledge and capacity for personal networking, diversity, and divergence as the source of creativity and innovation that are vital factors for the survival on the changing markets.

That is presented as coordination between the formalized knowledge, understood as assets' flow, and the human capital that embodies the living process of cognitive production, of knowledge creation and implementation. The formalized knowledge is not opposite, in such an explanatory scheme, to the informal knowledge, but to the process of knowledge producing, that is formulated with the concept of human capital.

The diametrical evaluation obtained from the banking and from the industries of chemistry and handicraft demonstrates the distinction between the activities that can be easily formalized and digitalized (such as assessment of investment project, credit potential, deposit interest rate, etc.) and those that cannot, where the value is created personally, originally, in a unique way due to the diversity and divergence of individual knowledge and ingenuity.

Nevertheless, this evaluation is insufficient for understanding the capabilities of organizations to face a crisis such as a pandemic. The global impact of the COVID-19 pandemic represents the common decrease of business off-line and the blossoming of online activities [83], the digitized processes are transferred to the cyber-space, the offline physical objects need sophisticated analysis, design, and development of specific complex systems such as digital twins [84] and visualized models. The chemistry organizations, where activities are embedded in the offline, have stopped their functioning during the "quarantine week" (a national non-working week in Russia, at the end of March 2020) and were not able to translate any processes (except accounting, only in the part that is permitted by the Russian tax and employment legislation), but they went back to work since the prohibition was abolished by the government. The remote work could not be a solution for any of the processes of their value creation chain. At the same time, the handicraft business had been organized at a high degree in the form of remote work with the large use of freelance, with the high degree of the distance activities (e.g., using postal expedition or couriers), the social isolation did not damaged deeply this sector (the tourist market is collapsed for souvenirs, but the sector of collections stays almost untouched by the pandemic). Therefore, the two opposite examples demonstrate the distinctive strategies of organization of unique intellectual labor with highest level of personal competency, that are determined by the technology (chemical processes need specific equipment and uses dangerous raw materials; handicraft products are manufactured at home). Both of these activities represent the value chain where the automation either cannot produce the similar result or will lead to the sharp reduction of quality (perceived and factual elements of quality) and price.

The educational institutions took the intermediate position: the transfer to the remote regime caused deep and numerous changes for education, even if some elements of online learning and distance courses were already introduced in the "normal" face-to-face educational practices. Both teachers and learners revealed that the process of education includes not only the replication of texts, but also the social exchange, non-verbal communication, emotional contamination and motivation, the imitation of subtle nuances of behavioral models, etc. If the teachers have seen their charge increased, the students perceived the decrease of the quality of education and required the decrease of pay because of lack of knowledge obtained.

The investigated businesses elaborated various attitudes to the implementation of the remote work regime during the pandemic. The group discussion that took place in November 2020 permitted to have a preliminary look at the results of the evolution of the

organization of activities. The representatives of the examined industries pointed out the essential difficulties of different nature:

- the banking sector already had introduced the digital technologies in finance (“fintech”, financial technologies) at a high degree, and the contraction of physical presence is limited partly by the preferences of clients, partly by the legal regulations, i.e., the norms of legislation require physical presence of client for specific operations;
- the high degree of digitized processes which had been already introduced permitted the banking institutions and IT sector companies to be efficient during the social isolation, and at the same time, demonstrated the part of the activities which still requires the physical presence and interaction of people involved that is related to the problem of confidence and of trustful relationship construction;
- the preferences of clients demonstrated the higher value of the personal interaction, especially, for some generations or categories of customers (e.g., banking sector includes the services for persons of elder generations who do not trust to “all these modern tricks and gadgets” and who still come to the bank offices; the same remark concerns several categories of clients who need the personal contact with the IT specialist to get help with equipment, physical infrastructure connection, or software installation, and for some kinds of activities (in education, transfer of knowledge includes the transmission of culture that is more significant, than the duplication of textbooks or video-lectures);
- due to the pandemic, the IT sector and organization of software development met a high demand for the services of digitalizing from the market. This increase of the demand, in a paradox way, required the more frequent physical presence of specialists, e.g., the use of the internal cloud services required higher attention to the servers and data treatment centers, the presence of technical specialists and the involvement of the carriers, expeditors, and logistics specialists. The increase of the physical assistance is provoked by the physical equipment maintenance and modernization.

The COVID-19 pandemic consequences are classified according to the level of the previously achieved degree of remote activity (1); taking into account the legal limitation for the applied distance technologies; to the degree of digitalization of the industry and the trustful relationship to build (2); to the market rigidity (3); and to the equipment which needs maintenance (4).

The higher degree of personal competency and knowledge allows companies to better cope with the negative dynamics of markets and to find new segments, to re-orient the activity to the sustainable audience, especially with the strategy of networking. The representatives of the chemistry, handicraft, and IT sectors said that the essential factor for the successful survival during the social isolation was the inclusion of the people of the companies in the social networks of trustful relationship with clients, within the industries and among the partners.

The individual level of competency helped the digital transformation (in IT-sector), the search of new segments and re-orientation of strategy to new audiences (in handicraft), the assurance of quality and confidence of clients (in chemistry). The inclusion in networking and the collective efforts to build connections between business actors within value creation chain played the crucial role for all these industries for the more sustainable development despite the “corona-crisis”.

The degree of penetration of digital technologies in the sectors of large institutions such as banking and education played the similar positive role for a better organization of remote work, but had the different impact for the controlling procedures: in banking institutions, the legal regulation strictly determines the majority of operations and decisions made. In education, the controlling was perceived as excessive charge and burden at the moment, when the key efforts were directed to the adaptation of both students and teachers to the new context of work. The remarks of the interviewees concerned the accuracy that is necessary to support the motivation and commitment in the less formalized sector

(education), while procedures of digital methods of controlling play considerable role for the more regulated sector (financial services).

The creation of new knowledge happens on the boundaries of actors in contact, according to Kurt Lewin [85,86] and requires open business modelling and re-thinking the basic assumptions [12,28]. The regulation and governance help to overcome this simplified technocratic standardized approach to management [87,88], but the hierarchical nature of political and organizational structures undermines the attempts to implement a more holistic vision and to treat the informal personal knowledge as the key component of intellectual capital and core factor of innovation growth and value creation. The rise of start-ups and entrepreneurship (including corporate intrapreneurship) represents the personal involvement into the realization of an innovation.

## 7. Conclusions

The results of the research demonstrate the complex character of the knowledge and its implementation within the value creation chain. Managers' awareness of the importance of intellectual capital, as it emerges from the survey, is far from being homogeneous and above all a picture emerges which is closely linked to the type of sector to which the organizations belong. In particular, the individual aspects within intellectual capital—human capital, relational capital, formalized and informal knowledge, etc.—are clearly perceived by the interviewees as having decidedly different impacts according to the different sectors.

The research is limited to the Russian context. In the introduction, the studies are mentioned that demonstrated weak, null, or negative impact of intellectual capital of a company on its performances (in Brazil [72], in India [69], in Turkey, in Islamic banking sector [68]). The research of organizational management and performance in cooperation with Chinese colleagues showed the specific features typical for China corporate governance and regulative mechanisms [89–93]. The importance of various factors is underlined in the research of the Organization for Economic cooperation and development, OECD: “besides the industrial structure of countries—i.e., differences in the composition of types of jobs leading to workers performing a different mix of tasks in each country—other factors such as culture, use of managerial practices, the digital infrastructure, the skill endowment or the age structure of the workforce may drive these differences” [94]. This diversity is to be taken into account for the analysis of the role of the tacit knowledge creation as a factor of corporate performance.

The research findings are summarized according to the hypotheses as follows:

- H1 asserts a perception by managers of a dramatic role for the company performance and value creation. This hypothesis is confirmed with qualitative methodology, but no or little evidence could be found to support this with statistical analysis;
- H2 is supported by the comparison of data—managers are aware of the intellectual capital components: the intangible assets (Q5, Tables 4 and 7), the relational capital (Q3–4, Tables 5 and 6), the human intellectual capital (Q7–8, Table 8), and structural organizational capital (Q2 and Q6, Table 4 and Figure 2);
- H3 is supported by the results of Q6–8—the experts recognize the importance of the tacit knowledge that is presented in practices (Q6, Figure 2) and in human personal knowledge (Q7–8, Table 8);
- H4 is supported by data: H4.1—the formal intangible assets play a lower role than the informal knowledge elements (Figure 1), and H4.2—the intellectual capital has a complex structure, the tacit knowledge is perceived as necessary for value creation (Q4 and Q6, Table 6 and Figure 2), but uncertainty about the income and cost of the intellectual property (Q2 and Q5, Tables 4 and 7) determines the managers' preference in favor of controlling procedures even if the conformity to bureaucracy limits the performances (e.g., wrong answers to Q2, discussed in Section 5);
- H5 is supported by data on the mentioned preference to reporting despite the real knowledge creation performances (Q2), and the analysis of correlation of responses of the tacit knowledge importance with the size of company (0.637 Pearson' coef-

ficient) witnesses the impact of reporting and controlling aspects on the choice of administrative staff.

Consequently and consistently with what emerges from the survey, the public measures and instruments, made available to encourage the growth of intellectual capital, must be selectively studied and addressed taking into account the fundamental differences of the economic sectors. Otherwise they risk being ineffective, or at least much less effective than it could be and than it is conceived, e.g., the hypothesis 5 is proven for banking sector, but seems to be fully or partly refuted in other sectors of activities.

The formalized and digitized knowledge is adapted for machine learning and regulation based on the algorithmic rules. Real life differs from the set of phenomena that can be measured and quantified by diversity of aspects to be taken into account. The living intellectual activity producing knowledge is a sophisticated subject, including ingenuity and networking, building new links between people and companies, and the search for innovative solutions [95,96]. Today, neural technologies are still not able to simulate the total universe of knowledge production by humans, neuro-communications are limited in quality, precision and capacities, AR and VR (augmented and virtual reality) applications are bounded by the technologies progress and neural-physiological studies, and big data analysis and machine learning do not allow the similar creativity that could be compared with the human ingenuity [97–101]. Digital regulation is efficient in routine operations, but still is less efficient in helping to solve non-standard problems [102,103]. The pandemic implementation of digital tools demonstrates the technical efficiency, but the intellectual capital development still needs to be directed by humans: controlling systems and reporting procedures introduced due to the social isolation imposed by COVID-19, increase the productivity of measured monotonous routine work, but de-motivate employees, enhance stress, and decrease the creativity (“carry risks for innovation and worker satisfaction” [94]).

Emerging countries foster their national and regional protection policies in the cyberspace, Russian-speaking Internet (Runet) [104] is closed with the condition of mastering the language. National examples of digital regulations (e.g., the cases of Australia legal requirements to Google accepted by the corporation in February 2021, of the autonomous Chinese space with the Great Firewall [105]) demonstrate the importance of better understanding of the perceptions and rules for the up-to-date online communications via Internet.

The use of digital tools can help to model the complex interaction between regulative instruments with the purpose to achieve the targeted results of the successful development of a company or a region in the global market, offline and online. The results of the research can be helpful for corporate governance in the field of the digital regulation and intellectual capital growth in the open innovation models of business based on the networking of individual and collective levels.

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## Appendix A

The questionnaire used for the study is presented in the Table A1.

**Table A1.** List of questions of the interview.

Q1	Does knowledge play a significant role in the success of your company?
Q2	Has your company created and registered any intellectual property (IP) right—patents, licenses, registered software, etc.?
Q3	Is your trademark registered?
Q4	Which role plays a reputation for the success of the business?
Q5	Do you use expensive technologies, software, or other external intellectual property?
Q6	Do you think that formalized knowledge creates higher value, than informal knowledge?
Q7	Do you have personalities in your company who plays an absolutely crucial role for the company stable functioning and growth? <sup>1</sup>
Q8	What are the positions of core persons? <sup>1</sup>

<sup>1</sup> The last two questions were discussed together.

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